

POWER TAP™



POWER TAP™ PRO



USER MANUAL

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## INTRODUCTION & PRECAUTIONS



Thank you for purchasing the CycleOps Powertap™ or Powertap™ Pro. Until now, instruments for measuring power have been expensive, inaccurate, and difficult to use. We designed the CycleOps Powertap™ and Powertap™ Pro to be extremely accurate, reliable, affordable, and easy to use and install. Power is the ultimate performance yardstick for cyclists who want to measure intensity. No other piece of cycling equipment will give you a greater return on your investment.

### PRECAUTIONS: IMPORTANT

1. Before beginning any training program, always check with your physician.
2. Keep your eyes on the road. Do not become overly engaged with the Powertap display. We recommend familiarizing yourself with computer functions while stationary.

3. The computer, receiver, and hub are water resistant. However, avoid extended submersion or high-pressure sprays directed at Powertap components.
4. Wash off dirt with a mild detergent on a soft cloth. Wipe excess water off with a dry cloth. Do not apply kerosene, paint thinner, alcohol, benzine or other such solvents to any Powertap components.
5. The plastic cover on the hub should be removed only when replacing batteries, or when allowing the unit to dry after submersion in water. *Only turn screws 7 times maximum when reinstalling the battery cap. Hub battery life is approximately 3 months of use.*
6. The Powertap wheel does not include a quick release skewer. CycleOps recommends using a steel skewer.
7. Both sides of the Powertap hub should be built with at least a two-cross spoke lacing pattern. Because of the PowerTap design torque is transferred to the non-drive side as well as the drive side.
8. Electromagnetic interference, such as interference caused by high power lines, may briefly disrupt the communication between the hub, chest strap and computer.
9. The Powertap is available only in a 130 & 135mm range of axle lengths to accommodate different frames and uses. *Only use similarly sized frames and hubs.*  
Failure to adhere to these precautions may cause premature failure or incorrect operation of the unit and may void the warranty.



## SYSTEM OVERVIEW

### The Powertap System

The Powertap system includes a power-measuring hub which measures torque and wheel speed. This information is then transmitted via digital radio frequency to a receiver mounted on the seat stay. The data is wired to the Powertap computer mounted on the handlebar. The computer receives the signal from the heart rate monitor chest strap to provide heart rate information. All of this information is then processed for display on the computer.

### Preparing for Installation

The Powertap hub comes either in a pre-built wheel or alone, ready to build into a wheel. The power measuring hub must be built into a complete wheel prior to installation. Other items necessary for installation are a cassette, spoke protector, reflectors, skewer, rim strip, tire, and tube (clincher rim) or glue and tubular tire (tubular rim). Please read all instructions prior to installation. Also take a moment to verify the package contents. The installation procedure with a complete wheel requires only a

trimmer to clip the cable ties. However, assembling the wheel, cassette and other parts requires the proper tools and experience. If you are unsure of any step of the procedure or do not have all of the tools necessary for installation, contact your local dealer for assistance.

Package Contents	
Qty	Item
1	Powertap hub (or built wheel)
1	Powertap computer
1	Receiver
1	Heart rate chest strap
2	Foam mounting tapes
6	Cable ties
1	Training With Power guide
1	Product registration card
1	Link Software CD
1	Link cable
1	Link Quickstart Guide



Complete Powertap wheel

### Compatibility

The Powertap hub is compatible with Shimano 8 and 9 speed systems. Campagnolo systems can be used with the Campy Adapter, available at your Powertap dealer, part #7024.

Only insert the correctly spaced Powertap hub into your frame. For example, only use a 130mm-spaced hub in a 130mm road frame. Do not force the hub into any frame. Doing so may cause failure of the frame, hub, or both, and will void the warranty. Contact your dealer or Powertap to address any special compatibility issues.

# WHEEL BUILDING



## Wheel Building

Contact your local wheel building professional or dealer for assistance in building the Powertap hub if not provided as a complete wheel. The flanges are drilled for 14 or 15 gauge spokes. Use at least a two-cross pattern on both sides of the hub. Due to the design of the hub, the load path is not the same as with a conventional hub. Slotting the hub flanges to accommodate bladed spokes is not recommended and will void the warranty.

*Reference a spoke-length calculator when building a wheel not listed in the provided table.*

## Common Spoke Lengths (3 cross pattern)

Rims	Drive	Non-Drive
32 Hole Mavic Open Pro (700C)	291	291
28 Hole Mavic Open Pro (700C)	295	296
28 Hole Velocity Deep V (650C)	260	262
32 Hole Mavic X517 (MTB)	259	259
28 Hole Mavic CXP33 (650C)	267	268
28 Hole Mavic CXP33 (700C)	293	294

## Wheel Building Dimensions

Measurements	Drive	Non-Drive
Hub center to flange	16.7mm	32.7mm
Flange Diameter	66mm	78mm
Spoke hole diameter: 2.4mm		



## SYSTEM INSTALLATION

### 1. Insert Wheel Into Frame

Insert the complete built Powertap wheel into the frame. Make sure the axle is correctly positioned in the dropouts and secure wheel in place with a steel skewer(Fig 1).

### 2. Attach Receiver To Seat Stay

Locate the bottom of the receiver 7 inches from the Powertap axle, and attach the receiver to the seat stay using two cable ties. Place foam tape between receiver and frame for a slip-free fit. If necessary, rotate receiver inward to within 5 degrees of parallel with the hub battery cover before tightening cable ties.

The head of the cable tie fits flush into a recessed cavity in the receiver. Pull the cable ties tight to secure to the frame and clip off any excess cable tie. Route the wire along the seat stay and top tube to the handlebar area. Wrap around brake housing and/or use cable ties to affix the wire to the frame. Be careful not to crimp the receiver wire with cable ties. Allow a small amount of slack in the receiver wire where it meets the reciver. Unneceassary stress at this point can lead to receiver failure.



Figure 1: Mounting position of receiver



Figure 2: Mounting angle of receiver

# SYSTEM INSTALLATION



Figure 3A: Mounting of computer mount



Figure 3B: Cable ties

## 3. Attach Computer Mount to Handlebar

The computer mounts to the handlebar in a similar fashion. Position the foam mounting tape beneath the mount and secure with cable ties to handlebar(3A). The head of the cable tie fits flush into a recessed cavity on the mount. (see figure 3B)

## 4. Place Computer

Place the computer into the mounting shoe on the handlebar. Line up the slots on the base of the computer with the bracket. Slide completely into computer mount. (see figure 4)



Figure 4: Attaching of computer



Figure 5: Placement of heart rate strap



Figure 6: Transmission icon in upper left corner of display

## 5. Heart Rate Monitor Strap

Position the heart rate monitor strap on your torso as pictured in figure 6. The strap should rest just beneath the pectoral muscles of the chest. Make sure the electrodes on the strap are slightly moist where it contacts the skin for best results. The heart rate strap must be worn to enable the heart rate functionality of the Powertap. (see figure 5) The chest strap is not coded.

## 6. Verify Installation

Check all the components to make sure they are securely attached. Spin the rear wheel and verify that the transmission icon on the computer display is illuminated (see figure 6). Adjust the receiver if necessary.

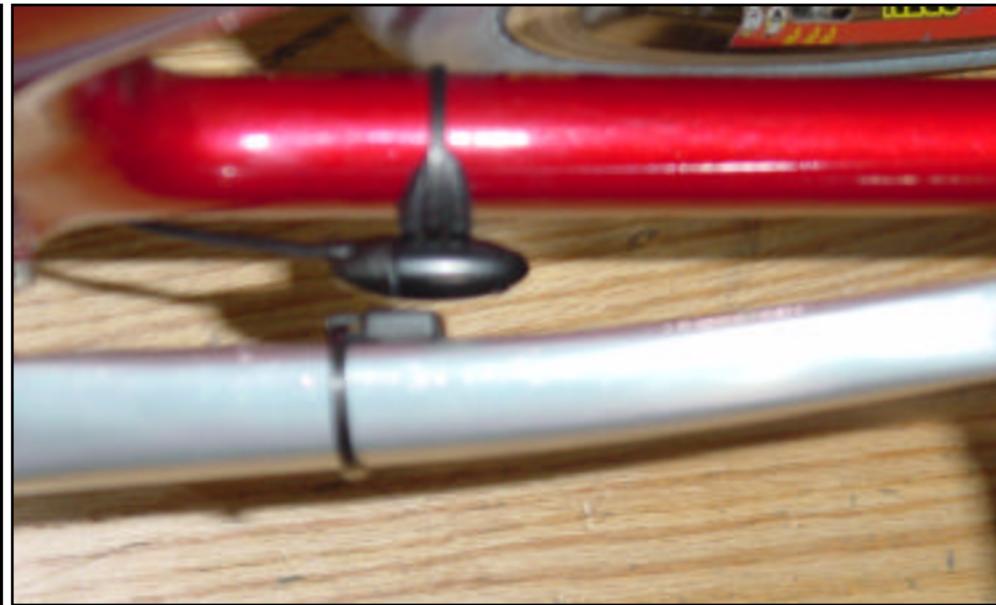


## POWERTAP PRO RECEIVER INSTALLATION



**Powertap Pro Cadence Wire**

7. Route cadence cable towards non-drive side chain stay, wrapping excess wire around frame.
8. Mount cadence sensor using cable ties.
9. Position magnet on crank arm so that it passes within 3 mm of the cadence sensor.



# POWERTAP STANDARD COMPUTER GENERAL OPERATION



## General Operation of Computer

The Powertap has three main displays: power display (top), speed display (middle), and multi-function display (bottom). There are two main modes of operation in the Powertap: trip mode and interval mode.

### Mode Button (Left)

Press the mode button to scroll between the different displays. The active display is indicated by small black triangles at the left and right side of the display. Hold the mode button down for two seconds to toggle between trip and interval modes. The "INT" icon will illuminate when you enter interval mode.

### Select Button (Right)

Press the select button to select which function is shown on the current display. The current function will remain on the display even when the mode button is used to move to another display. The select button also starts, stops and indexes intervals in interval mode.

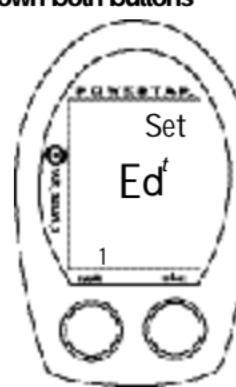
### Menu (Both Buttons)

To enter the set up main menu hold down both buttons until the main menu is displayed  
Press select to choose the desired set up and press mode to begin set up.

E = exit, return to ride mode

d = restore default settings

T= Test Mode



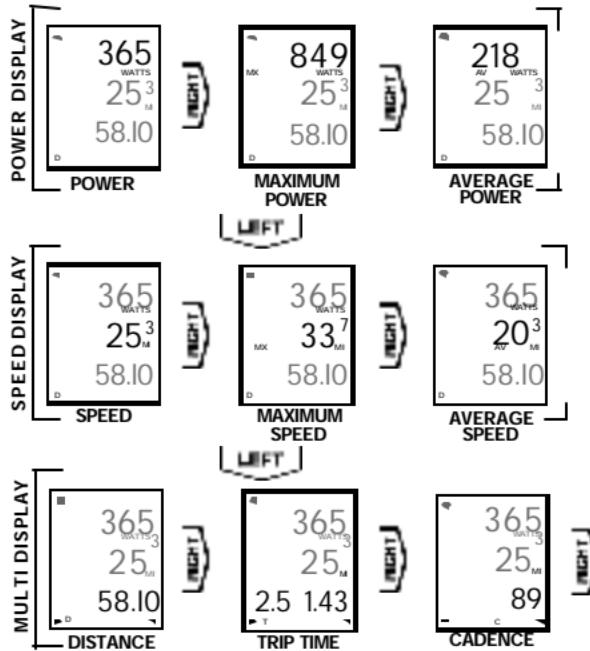
Main Menu

asleep. Spin the wheel momentarily and the icon will illuminate.



Figure 7: Powertap button and display summary

# POWERTAP STANDARD COMPUTER NAVIGATION

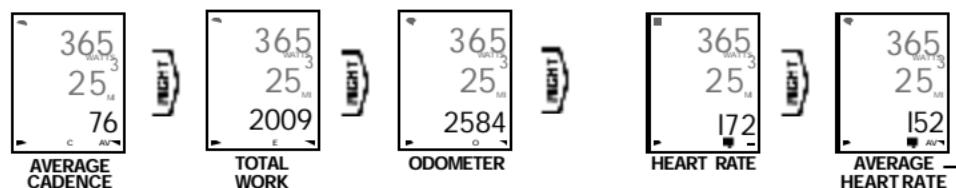


## Trip Mode

Powertap trip mode displays and records trip data for current, average and maximum power and speed, distance, trip time, current and average cadence and heart rate, total work, and odometer.

## Navigating the displays

Trip mode uses the power, speed and multifunction displays to show information. The arrows at the side of each display denote which display is active. The mode button (left) changes between the power, speed, and multifunction displays while the select button (right) selects functions within each display. All three displays update approximately once per second.



## Clearing Trip Data

To clear all trip information, hold both buttons until "cLr" is displayed, then release. To clear interval memory see page 9.

## Changing Between Trip and Intervals Mode

Hold down the mode button for two seconds to enter interval mode. The "INT" icon will illuminate and the first available interval number will be shown. To return to trip mode, hold the mode button for two seconds.

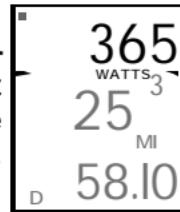
Figure 8: Trip mode display navigation

# POWERTAP STANDARD COMPUTER NAVIGATION



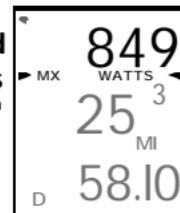
## Current Power

Instantaneous power output is displayed from 0 to 1999 watts in 1 watt increments. The "WATTS" label is visible during this mode on the power display.



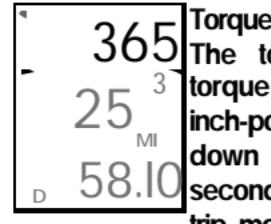
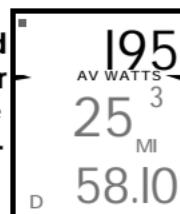
## Maximum Power

This value is the highest recorded power output since the last time this data was cleared. Both the "WATTS" label and the "MX" icon denote maximum power.



## Average Power

This function displays the calculated average power output measured over the course of your ride or interval. The "WATTS" label and the "AV" icon are visible when average power is shown.



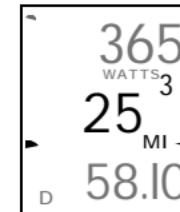
## Torque

The torque function shows the torque placed on the hub in inch-pounds. To display torque, hold down the select button for two seconds while on the watts display in trip mode. The "WATTS" label is not visible with torque. Press select to return to the power display.

## IMPORTANT How To Zero Torque

Occasionally, the torque must be zeroed to ensure that the Powertap displays the most accurate power information. If the instantaneous power is positive or negative while coasting, the torque needs to be zeroed. This operation must be done while coasting with no tension in the chain or while stationary with no force being placed on the pedals. Also, the transmission icon must be illuminated.

To zero torque, hold down the select (right) button for two seconds to enter torque mode. Then hold down select again until "0" is shown. Push select once to return to watts. The torque value will now read zero.



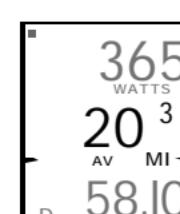
## Current Speed

Your current speed is displayed in miles per hour or kilometers per hour up to 99.9 mi/hr or km/hr in 0.1 mi/hr or km/hr increments. Only "MI" or "KM" is shown with current speed.



## Maximum Speed

This function displays the highest recorded value of the speed. The maximum speed is shown with "MI" or "KM" and the "MX" icon on the speed display.

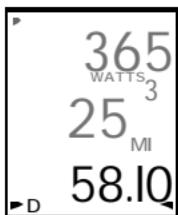


## Average Speed

This function displays average speed in miles or kilometers per hour. Average speed displays with "MI" or "KM" and the "AV" icon on the speed display.

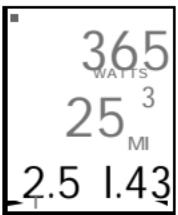


## POWERTAP STANDARD COMPUTER NAVIGATION



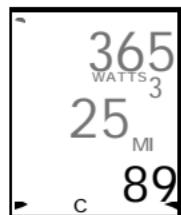
### Distance (D)

Total trip or interval distance is displayed in miles or kilometers from 0.00 to 999.99. The "D" icon is shown on the multifunction display. Distance displays in the same units as speed.



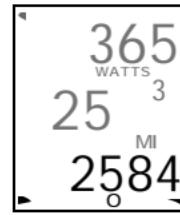
### Trip Time (T)

The timer displays trip or interval time to 9.59.59. The trip time auto starts and auto stops with rotation of the wheel.



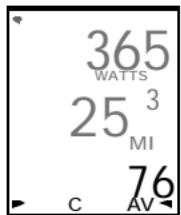
### Cadence (C)

The rate of pedaling is shown from 40 to 140 RPM. This is measured in the hub from your pedal stroke torque profile. When cadence is below 40 or above 140, it is not displayed.



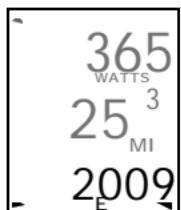
### Odometer (O)

Total accumulated distance travelled since the last system reset is displayed in whole miles or kilometers. Note: System resets if battery is removed.



### Average Cadence (C AV)

Average cadence is measured in RPM. Both the "C" and "AV" icons are illuminated on the multifunction display when this mode is active.



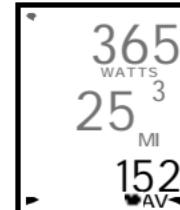
### Energy Expenditure (E)

The total work done over the course of the trip or interval is shown in kilojoules. This value is a measure of the total energy expended over the course of your ride. Kilojoules can be converted to dietary calories using a 1:1 ratio.



### Heart Rate (HR)

Current heart rate is shown up to 255 beats per minute. You must wear the heart rate chest strap to enable heart rate measurement, and the hub transmission icon must be on. Note: A Powertap uses a non-coded chest strap.



### Average Heart Rate (HR AV)

This value is a running average of the heart rate in BPM. If there is no heart rate information, this will display as 0. Both the heart and "AV" icons are shown while in this mode.

# POWERTAP STANDARD INTERVAL MODE/POWERTAP STANDARD COMPUTER SET UP



## Interval Mode

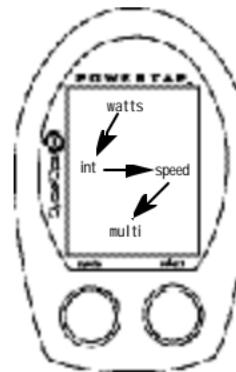
The Powertap Interval mode functions differently than the previous Powertap computers. It works as a lap marker, and is essentially always on. To begin the first interval, or advance the interval, simply press both buttons down simultaneously from any location or mode in the display. "INT" and the new interval # will briefly appear, before disappearing again to the background. To view interval specific information (duration, distance, averages, etc) simply hold down the mode button for two seconds. This brings interval mode to the foreground. "INT" and the interval number will constitute a fourth line in the display (see picture at right). When you wish to relegate the interval information to the background again, simply depress the mode button for two seconds.

## Interval Memory Mode

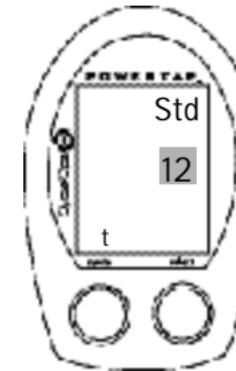
To access stored interval information select "INT" by pushing mode until "INT" blinks. Then hold select for 2 seconds until M appears next to the interval number indicating you are now viewing interval information. Push select to advance to the interval you wish to view and push mode to select the information you wish to view. (Ave. watts, cadence, etc.) To exit Interval Memory Mode hold mode for 2 seconds. *Note that recovery periods as well as work periods are displayed in memory mode.*

## Interval Shortcut

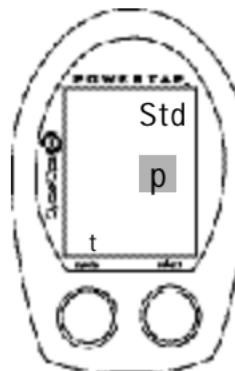
To quickly mark intervals simply push both buttons simultaneously from either trip or interval mode. If in trip mode "INT" will briefly appear indicating you have marked an interval and which number interval you are on.



## PowerTap Standard Computer Set Up

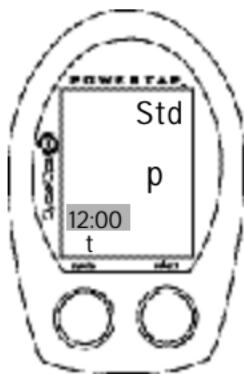


Press select button to select 12 or 24 hour clock.  
Press mode button to save.

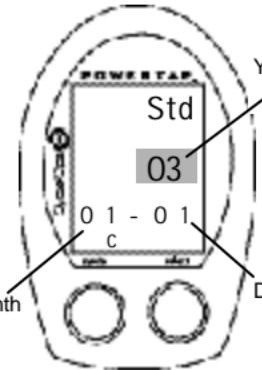


Press select button to select AM(A) or PM(P).  
Press mode button to save.

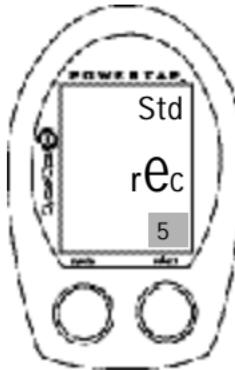
# POWERTAP STANDARD COMPUTER SET UP



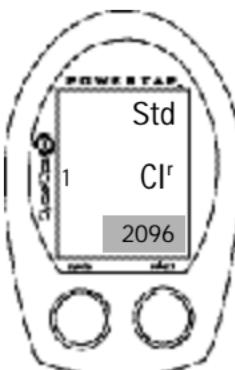
Press select button to change digits.  
Press mode button to advance.



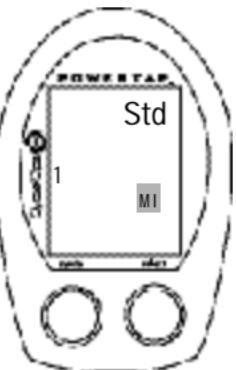
Press select button to select year, month and date.  
Press mode button to advance.



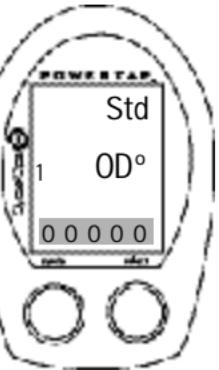
Press select button to select the storage rate.(1,2,5,10,or 30seconds.)  
Press mode button to save.



Press select button to change digits.  
Press mode button to advance to next digit.



Press select button to select English or Metric units.  
Press mode button to save.



Press select button to select starting Odometer reading.  
Press mode button to save.

Recording Settings (seconds)	1	2	5	10	30
Max. Recording Time (hrs)	7.5	15	30	60	180

**Run Time:** Different storage rates yield different amounts of total storage time. Refer to the chart on left to select the most appropriate storage rate.

Refer to wheel circumference guide for correct tire circumference. A roll out measurement (mm) of the rear wheel will give greatest accuracy.

\* For quick exit and saving of all changed set up features in Setup 1 only, hold both buttons.

\* See wheel circumferences on page23.

## POWERTAP PRO INTRODUCTION



### Powertap Pro

The main difference between the Powertap Pro and Powertap standard is that the Powertap Pro utilizes a different receiver (with an additional wire to read cadence) and offers the following set up modes:

Set Up 1: Time and Date, recording rate, wheel circumference, units of measure and odometer settings

Set Up 2: Display rates of watts, speed, cadence and heart rate

Set Up 3: Whether or not zero's are included in averaging

Set Up 4: Customizing the display, cadence source, sleep, data control for autostop

The following pages cover installation of the Pro receiver and navigation of the Pro CPU.





## POWERTAP PRO GENERAL OPERATION

### General Operation of Computer

The Powertap Pro has three main displays: power display (top), speed display (middle), and multi-function display (bottom). There are two main modes of operation in the Powertap: trip mode and interval mode.

#### Mode Button

Press the mode button to scroll between the different displays. The active display is indicated by small black triangles at the left and right side of the display. Hold the mode button down for two seconds to toggle between trip and interval modes. The "INT" icon will illuminate when you enter interval mode as well as the current interval number.

#### Select Button

Press the select button to select which function is shown on the current display. The current function will remain on the display even when the mode button is used to move to another display.

#### Menu (Both Buttons)

Hold both buttons for 2 seconds to enter the scrolling menu. There are two options to select by releasing the buttons: clr to clear all data and the main menu to enter setup.

#### Power Conservation

The computer and hub have power saving features to prolong battery life. The computer powers down the display after 4 minutes of inactivity. Press one of the buttons to activate the display. Similarly, the hub powers down after two minutes of inactivity. The transmission icon will not be visible when the hub is asleep. Spin the wheel momentarily and the icon will illuminate.



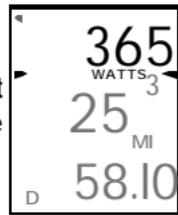
Figure 7: Powertap button and display summary

# POWERTAP PRO COMPUTER NAVIGATION



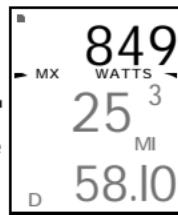
## Current Power

Instantaneous power output is displayed from 0 to 1999 watts in 1 watt increments. The "WATTS" label is visible during this mode on the power display.



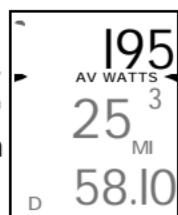
## Maximum Power

This value is the highest recorded power output since the last time this data was cleared. Both the "WATTS" label and the "MX" icon denote maximum power.



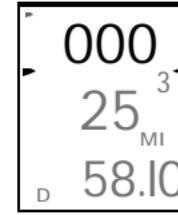
## Average Power

This function displays the calculated average power output measured over the course of your ride. The "WATTS" label and the "AV" icon are visible when average power is shown.



## Torque

The torque function shows the torque placed on the hub in inch-pounds. To display torque, hold down the select button for two seconds while on the watts display in trip mode. The "WATTS" label is not visible with torque. Press select to return to the power display.



## IMPORTANT How To Zero Torque

Occasionally, the torque must be zeroed to ensure that the Powertap displays the most accurate power information. If the instantaneous power is positive or negative while coasting, the torque needs to be zeroed. This operation must be done while coasting with no tension in the chain or while stationary with no force being placed on the pedals. Also, the transmission icon must be illuminated.

To zero torque, hold down the select (right) button for two seconds to enter torque mode. Then hold down select again until "0" is shown. Push select once to return to watts. The torque value will now read zero.

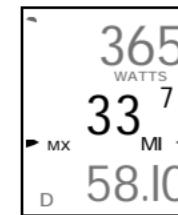
## Current Speed

Your current speed is displayed in miles per hour or kilometers per hour up to 99.9 mi/hr or km/hr in 0.1 mi/hr or km/hr increments. Only "MI" or "KM" is shown with current speed.



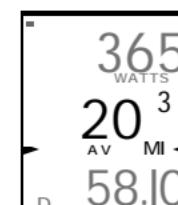
## Maximum Speed

This function displays the highest recorded value of the speed. The maximum speed is shown with "MI" or "KM" and the "MX" icon on the speed display.



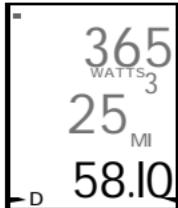
## Average Speed

This function displays average speed in miles or kilometers per hour. Average speed displays with "MI" or "KM" and the "AV" icon on the speed display.



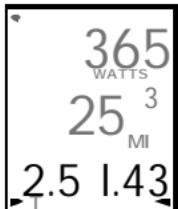


## POWERTAP PRO COMPUTER NAVIGATION



### Distance (D)

Total trip or interval distance is displayed in miles or kilometers from 0.00 to 999.99. The "D" icon is shown on the multifunction display. Distance displays in the same units as speed.

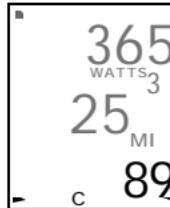


### Trip Time & Time of Day (T)

The timer displays trip or interval time to 9.59.59. The trip time auto starts and auto stops with rotation of the wheel.

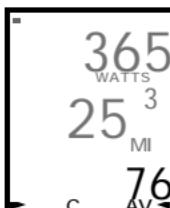
#### Time of Day

The real time clock may be accessed by holding select for two seconds. To return to trip or interval time hold down select for 2 seconds.



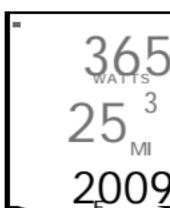
### Cadence (C)

The rate of pedaling is shown from 20 to 240 RPM. For quick access to the cycle computer function hold down select for two seconds while displaying current cadence.



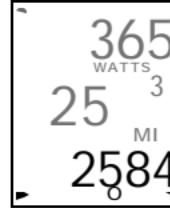
### Average Cadence (C AV)

The average of the cadence is measured in RPM. Both the "C" and "AV" icons are illuminated on the multifunction display when this mode is active.



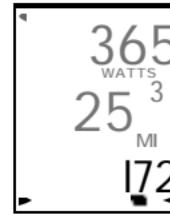
### Energy Expenditure (E)

The total work done over the course of the trip or interval is shown in kilojoules. This value is a measure of the total energy expended over the course of your ride. This is roughly equivalent to dietary calories expended.



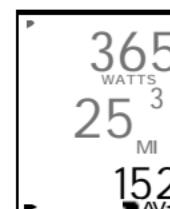
### Odometer (O)

Total accumulated distance travelled since the last system reset is displayed in whole miles or kilometers.



### Heart Rate (HR)

Current heart rate is shown up to 255 beats per minute. You must wear the heart rate chest strap to enable heart rate measurement, and the hub transmission icon must be on. Note: Powertap uses a non-coded chest strap. For heart rate monitor function only hold select for 2 seconds while displaying your heart rate.



### Average Heart Rate (HR AV)

This value is a running average of the heart rate in BPM. If there is no heart rate information, this will display as 0. Both the heart and "AV" icons are shown while in this mode.

# POWERTAP PRO INTERVAL MODE



## Pro Interval Mode

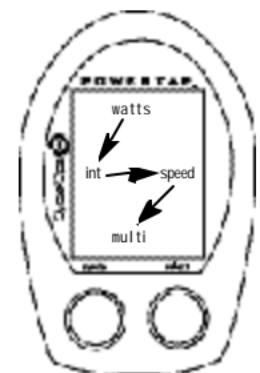
The Powertap Pro Interval mode functions differently than the previous Powertap computers. It works as a lap marker, and is essentially always on. To begin the first interval, or advance the interval, simply press both buttons down simultaneously from any location or mode in the display. "INT" and the new interval # will briefly appear, before disappearing again to the background. To view interval specific information (duration, distance, averages, etc) simply hold down the mode button for two seconds. This brings interval mode to the foreground. "INT" and the interval number will constitute a fourth line in the display (see picture at right). When you wish to relegate the interval information to the background again, simply depress the mode button for two seconds.

## Pro Interval Memory Mode

To access stored interval information select "INT" by pushing mode until "INT" blinks. Then hold select for 2 seconds until M appears next to the interval number indicating you are now viewing interval information. Push select to advance to the interval you wish to view and push mode to select the information you wish to view. (Ave. watts, cadence, etc.) To exit Interval Memory Mode hold mode for 2 seconds. *Note that recovery periods as well as work periods are displayed in memory mode.*

## Pro Interval Shortcut

To quickly mark intervals simply push both buttons simultaneously from either trip or interval mode. If in trip mode "INT" will briefly appear indicating you have marked an interval and which number interval you are on.





## POWERTAP PRO COMPUTER SETUP

1. Push either button to activate the computer.  
(Note: the version of firmware is displayed in the lower corner shown below)



2. To enter the set up main menu hold down both buttons until the main menu is displayed

Press select to choose the desired set up and press mode to begin set up.

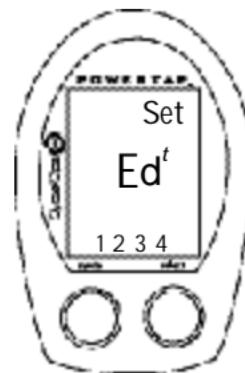
E = exit, return to ride mode

d = restore default settings

T= Test Mode

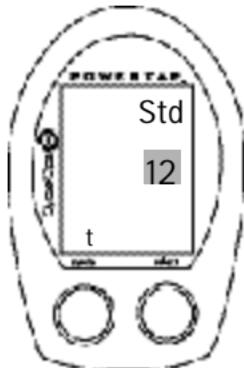
Setup modes 1-4 see following pages.

*Note: computer illustrations on the following pages display the factory default settings.*

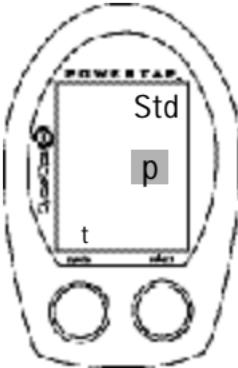


Main Menu

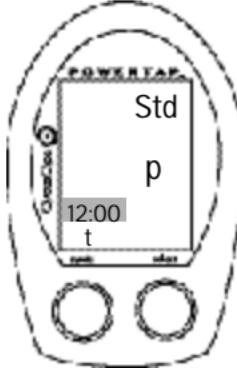
# POWERTAP PRO COMPUTER SETUP 1



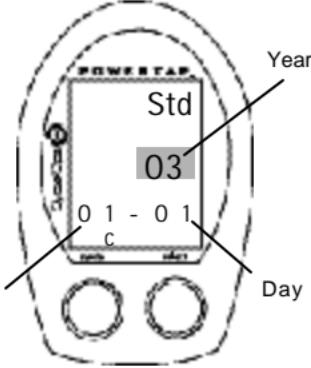
Press select button to select 12 or 24 hour clock.  
Press mode button to save.



Press select button to select AM(A) or PM(P).  
Press mode button to save.

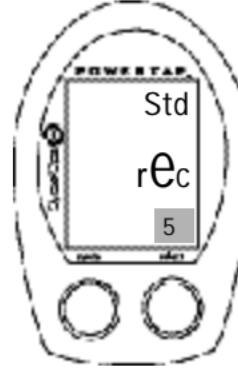


Press select button to change digits.  
Press mode button to advance.



Year  
Month  
Day

Press select button to select year, month and date.  
Press mode button to advance.



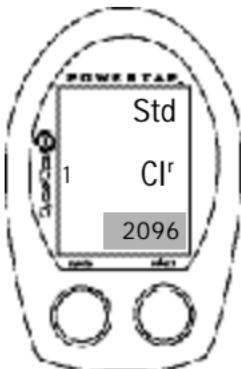
Press select button to select the storage rate.(1,2,5,10, or 30seconds.)  
Press mode button to save.

Recording Settings (seconds)	1	2	5	10	30
Max. Recording Time (hrs)	7.5	15	30	60	180

**Run Time:** Different storage rates yield different amounts of total storage time.  
Refer to the chart on left to select the most appropriate storage rate.

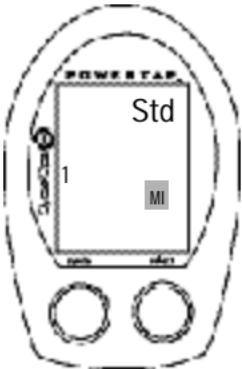
\* For quick exit and saving of all changed set up features in Setup 1 only, hold both buttons.

# POWERTAP PRO COMPUTER SETUP 1

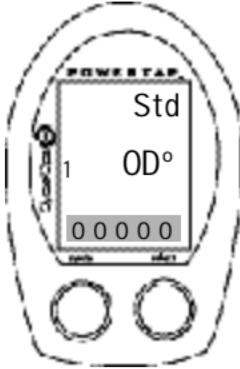


Press select button to change digits.  
Press mode button to advance to next digit.

Refer to wheel circumference guide for correct tire circumference. A roll out measurement (mm) of the rear wheel will give greatest accuracy.



Press select button to select English or Metric units.  
Press mode button to save.

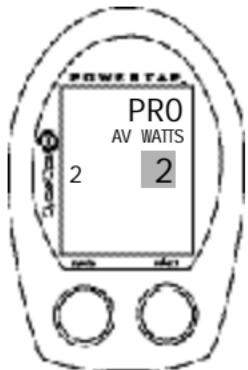


Press select button to select starting Odometer reading.  
Press mode button to save.

Note: Odometer settings are saved during battery changes.

Wheel Circumferences			
Tire Size	Circ.(mm)	Tire Size	Circ.(mm)
24 x1	1753	27 x1 1/4	2152
26 x1	1913	700C tubular	2094
26 x1.25	1953	700 x 20C	2084
26 x1.5	1986	700 x 23C	2096
26 x 2.0	2055	700 x 25C	2108
26 x 2.125	2070	700 x 28C	2116
27 x1	2125	700 x 32C	2136
27 x11/8	2139	700 x 38C	2170

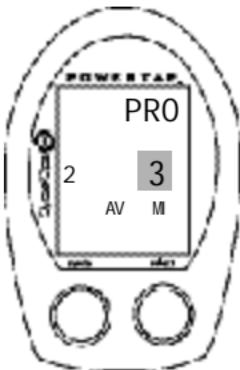
## POWERTAP PRO COMPUTER SETUP 2



Press select button to set rate of display for watts. (rolling average)  
Press mode button to save.

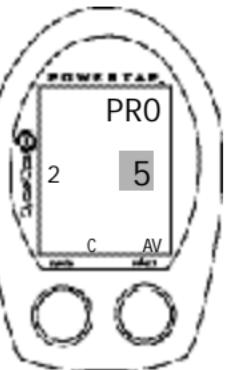
This function can be useful for allowing for better pacing during Time Trial efforts by allowing for a slower update of the display.

(1 sec. = display updates approx. every second, 3 = every 3 seconds etc.)



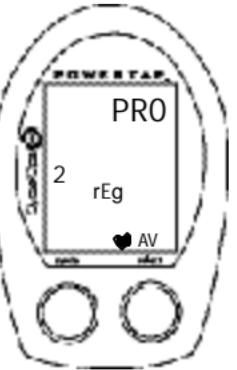
Press select button to set rate of display for speed. (rolling average)  
Press mode button to save.

This function can be useful for allowing for better pacing during Time Trial efforts by allowing for a slower update of the display.



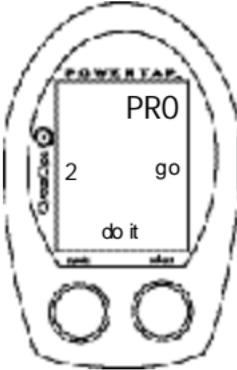
Press select button to set rate of display for cadence. (rolling average)  
Press mode button to save.

This function is useful for customizing how smooth the cadence display is for cadence based workouts.



Press select button to set rate of display for heart rate. (rolling average)  
reg = regular averaging  
slo = slow averaging  
fst = fast averaging  
Press mode button to save.

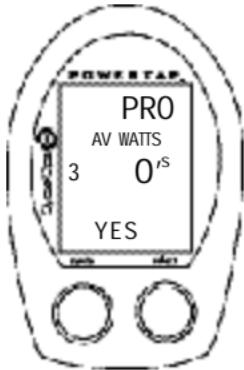
This function can be useful for allowing for better pacing during Time Trial efforts by allowing for a slower update of the display.



Press select then mode to reset defaults, press mode to save changes or "go do it".

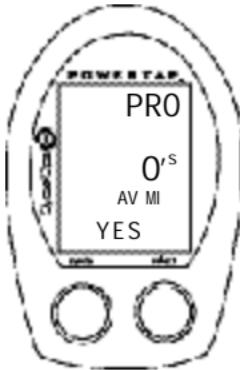


## POWERTAP PRO COMPUTER SETUP 3



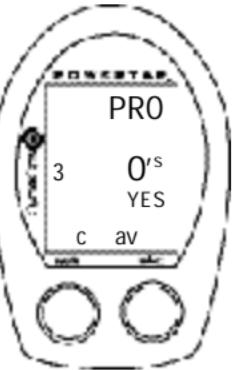
Press select button to select YES or NO for zeros included in averaging of watts.  
Press mode button to save.

This is useful if you are curious what your average power is when you are pedaling only.



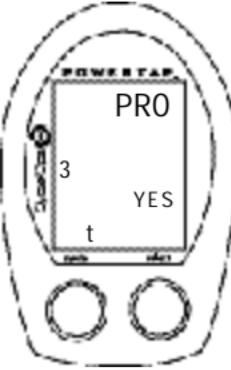
Press mode to select YES or NO for zeros included in averaging or speed.

This is useful if you are curious what your average speed is when you are pedal-ing only.



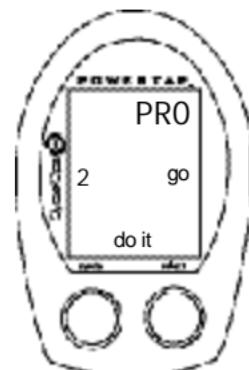
Press select button to select if zeros are included in Cadence average.  
Press mode button to save.

This is useful if you are curious what your average cadence is when you are pedaling only.



Torque auto-zero function. Normally leave at yes.

This is useful for track bike use where large negative torque may be present. Note: Hub modification to fixed gear is necessary.



Press select then mode to reset defaults, press mode to save changes or "go do it".

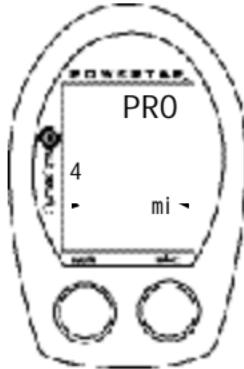
*Note: These settings DO NOT affect the data that is stored for download.*

## POWERTAP PRO COMPUTER SETUP 4



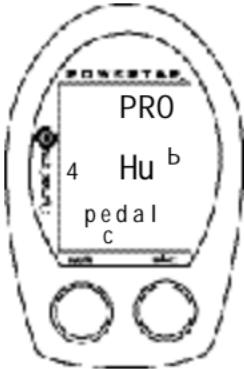
Press select to set how many minutes the CPU will stay "awake" after not receiving a valid speed or heart rate signal.

The shorter the sleep time the better the battery life.



Press select button to select what is displayed in the middle line.  
(mi= speed, c=cadence, =heartrate). Also, whatever is selected will flash during the ride to indicate what is displayed in the middle screen.  
Note that if heart rate or cadence is selected speed is not displayed at all.

This function is useful for intervals when power, heart rate and cadence are of most concern.



Press select button to select the cadence information source  
Default = hub then pedal  
Pedal = crank only  
Hub = hub only



## POWERTAP PRO COMPUTER SETUP 4

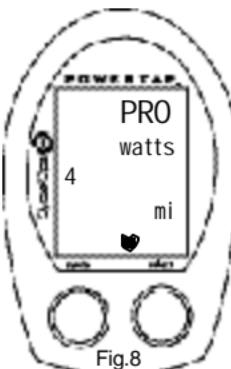


Fig.8



Fig.9

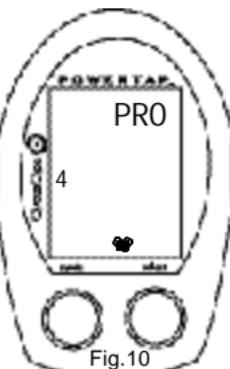


Fig.10

The Powertap Pro allows you to use the unit as a cycle computer or heart rate monitor only. Fig. 8 illustrates the Power Meter Mode . Press mode to leave in this setting. Push select to change to cycle computer mode.

Figure 9 illustrates cycle computer only mode. This mode requires a wheel magnet on a non-Powertap rear wheel. Align the magnet towards the bottom edge of the receiver so that it passes within 3mm of the receiver.

Push select until display looks like fig. 10 for heart rate only function. When this is in use all that will be displayed is current heart rate, average heart rate, trip time and time of day.

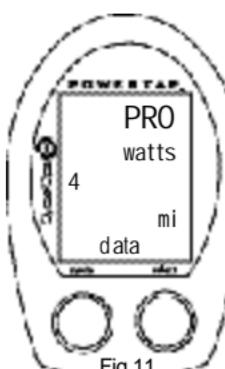


Fig.11

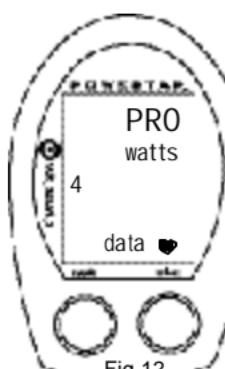
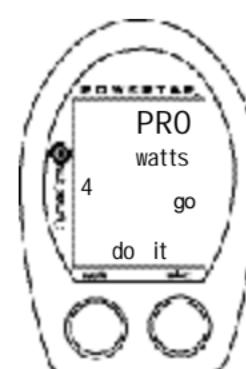


Fig.12

Press select to choose autostart control by speed (fig. 11). This will allow trip time to count whenever wheel speed is registering. If speed is not registering trip time will stop after 3 seconds.

Press select to choose autostart control by heart rate (fig.12). This will allow trip time to count as long as heart rate is registered. This function is useful for transitioning from cycling to running and vice versa.



do it

Press mode button to save (do it), press select button then mode to reset defaults.

## MAINTENANCE & SPECIFICATIONS



The Powertap uses a high quality hub designed to withstand the rigors of training and racing. With a little regular maintenance, you will enjoy years of trouble free use from your Powertap. If not familiar with working on hubs, you should take your Powertap to a bike shop with qualified mechanics for service.

### Serviceable and Non-Serviceable Parts

The power measuring components inside the Powertap hub are highly complex, and should only be serviced by a Powertap Service Center. The rest of the hub is very serviceable and similar to other popular high quality hubs in design. The axle, ball

bearings, cones and freehub body may be removed without further disassembly of the hub or removing the battery cover. The sealed axle bearings on the drive and non-drive side are replaceable by Powertap ONLY. Do not attempt to remove sealed bearings on the drive or non-drive side.

### Bearing Adjustment

Hubs should be checked occasionally for cone adjustment and bearing play. Should an inspection find excessive play in the bearings, tighten the cones and locknuts accordingly. If gritty or rough bearings are found, the hub should be disassembled, cleaned and overhauled. Repack or replace any bearings as necessary. If a problem exists in the sealed bearings please contact Powertap. Re-assemble as shown in figure 10.

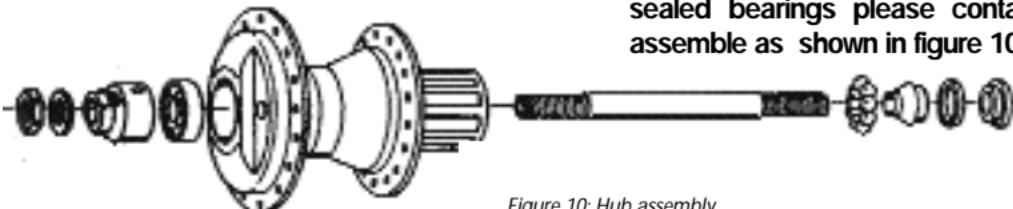


Figure 10: Hub assembly

### Cleaning

To clean the hub and components, use soapy water and soft bristled brush. If needed, mild biodegradable degreasers can be used sparingly. Do not use harsh degreasers on any of the plastic parts, rubber seals, or bearings. *Do not use a power sprayer.*

### Care For Electronics

The Powertap is water resistant. However, should moisture enter the hub, remove the battery cover and let dry overnight. Short term exposure to moisture should not damage the Powertap if it is thoroughly dried.

### Batteries / O-rings

Batteries should be replaced when the battery indicators denote low computer or hub batteries (see page 8). To replace computer batteries, remove the computer from the mount. Remove the battery cover on the back of the computer, exchange the battery, and replace cover as in figure 11. To replace hub batteries, remove the battery cover on the non-drive side with the two 2.5mm hex



## MAINTENANCE & SPECIFICATIONS

bolts. Insert new batteries and verify that the hub is working properly by spinning the axle while holding near the receiver before replacing the cover. Note: The batteries may fall out if you spin it without the cover on. The transmission icon should illuminate. Replace the cover and make sure the bolts are tight (7 turns max.) and an even seal is formed around the cover. Do not over tighten the cover bolts as this will damage the O-rings under the bolt heads. (See figure 12) Apply a light coating of synthetic grease to the O-rings to ease cover installation and extend O-ring life.

**Warning:** Do not remove any of the four bolts underneath the batteries. This will destroy the hub and will void the warranty.



Figure 11: Computer battery replacement



Figure 12: Hub Battery replacement

### O-Rings

There are four user-serviceable O-Rings that protect the Powertap electronics from the elements:

One O-Ring under each cover bolt and two O-Rings under the hub cover. Properly inspecting and caring for these O-Rings will ensure years of trouble free use. Follow the guidelines below:

1. Verify that both O-Rings are properly installed before installing the cover.  
*(See illustrations on page 34)*

2. Inspect all O-Rings every time you change the batteries in the hub. Replace them if O-Rings are torn, cracked or excessively dry. If necessary, contact Graber Products for an O-Ring replacement kit.

3. Lubricate the large O-Ring with synthetic grease to ease installation of the hub cover.

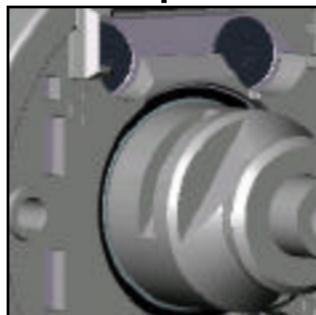
### Technical Specifications

Accuracy	+/- 1.5%
Signal Transmission	Digital RF
Interval Data Storage	unlimited
Interval Display	9 intervals
Operational Temperature	0 to 40 °C
Battery Life (Hub)	1,000 hours approx.
Battery Life (Computer)	100 hours approx.
Battery Type: Hub	N-Type, 1.5 volt/ANSI 910/IEC LR1
Battery Type: Computer	CR2032/ANSI 5004LC
Freehub fixing bolt torque	400 - 450 inch-lbs

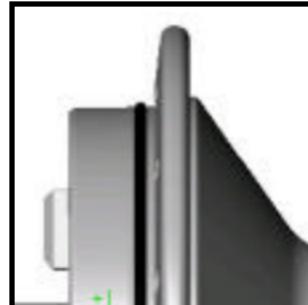
### Range of Measurement

Power	0 - 1999 watts
Torque	0 - 1999 inch-lbs
Speed	2 - 59 mph
Distance	3 - 95 kph
Trip Time	0.00.00 - 999:59
Cadence	40 - 140 RPM
Total Energy	0 - 99999 kJoules
Odometer	0 - 99999 mi or km
Heart Rate	0 - 255 BPM

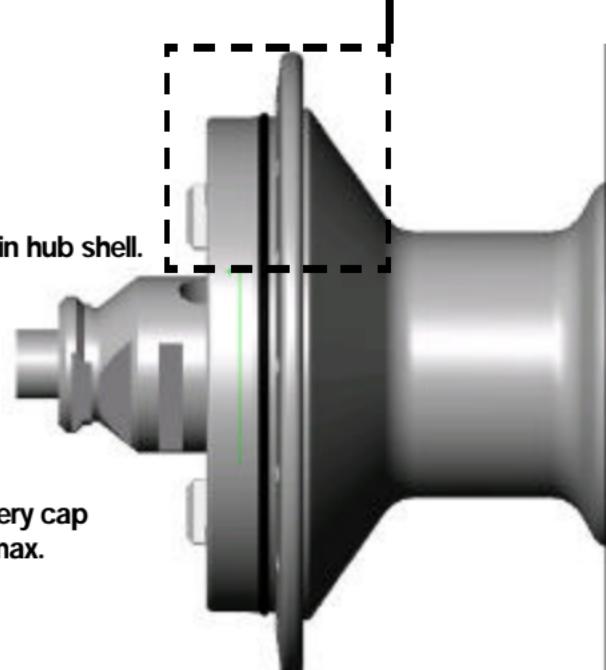
## O-RING PLACEMENT



Small O-Ring fits in groove around spacer.



Large O-Ring fits in groove in hub shell.



\* When reinstalling battery cap  
turn screws 7 times max.



- Starts when the "T" is selected from the setup menu.
- Lights the interval memory mode "M" icon and small number to left of it.
- Mode scrolls through the different test modes as shown by the number.
- Select generally performs the numbered item unless there is to be other inputs are being tested for.
- Pressing Mode and Select together for longer than 2 seconds returns to standard operation

#### 0 - Model and version.

Displays the model on the middle line and version number on the bottom line.

#### 1 - LCD test.

When Select is pressed all the LCD segments are displayed. Press Select again to return to the normal screen.

#### 2 - Receiver test signal. (Note the receive icon is displayed.)

The middle line display flashes "88" with each blip of data from the receiver whether valid or not.

#### 3 - Heart rate signal test. (Note the heart icon is displayed.)

The middle line display flashes "88" with each heart rate blip received.

#### 4 - Bike computer wheel magnet sense detect. (Note the MI KM icons are displayed.)

The middle line display flashes "88" with each sensing of the wheel magnet next to the receiver.

## TROUBLESHOOTING



### 5 - Cadence test. (Note the C icon is displayed.)

The top line display shows crank cadence sensor RPM. The middle line flashes "88" with each pulse from cadence sensor. The bottom display shows cadence RPM value from the hub.

### 6- Torque information. (Note the T icon is displayed.)

This displays information about the internal workings of the torque readings. The bottom display is the offset torque value directly sent by the hub torque with no correction applied. The hub sends a value of approximately 512 as the zero point. The middle line display is the correction-offset value currently stored in the CPU. This is the value that is changed when you do a manual zeroing of the torque. The top display is the corrected actual torque (the bottom value minus the middle value).

### 7 - Standard test file.

This mode writes a small test file to the memory. Press the Select button and the bottom lines says "run" and then "yes" when the file is written. This file can then be downloaded.

### 8 - Communication loop back test.

When looking at the frontside of the CPU, use a coin or paper clip to short out the two pins on the left side. Then press the Select button. The bottom line will say "run" and then "yes" if it passes the test correctly. If the pins are not shorted together or there was a problem, the display will say "no". This test can be repeated by pressing the Select button.

### 9 - Fast Memory test.

This does a quick test of the memory in the CPU. Press Select and it displays "run" on the bottom line. When the test is completed and it passes, it says "yes". If the test should fail, the bottom line will say "no".

## TROUBLE SHOOTING

The following are some problems you might have when installing and setting up your Powertap system. This list will be evolving, so please visit our web site for a current troubleshooting guide:  
<http://www.cycle-ops.com>

If your problem is not addressed here you can call Customer Service at 1-800-783-7257.

### Cadence shows "zero" or "dashes"

The Powertap cadence sensor is accurate between 40 rpm and 130 rpm. Anything outside of this range will be recorded as a zero. Since the cadence measurement is a "virtual" cadence (based on torque measurements) and not measured with an extra sensor it cannot read values outside of this range.

### Sometimes heart rate shows "zero" or "dashes"

Typically, this will happen if the chest strap contacts lose sufficient contact with the skin or if the battery in the Powertap computer is low.

### Heart Rate data seems incorrect

- No chest strap in use - if you are not using the Powertap chest strap, the receiver may pick up noise.
- No hub transmission - the transmission icon must be illuminated for the heart rate monitor functionality to be enabled. Spin the wheel momentarily to wake up the hub.
- Computer batteries low - replace the computer batteries as shown on pages 14-15 of the User Manual.
- Low battery in chest strap - replace chest strap batteries.
- Chest Strap not on properly- see page 8 or 21 in the User Manual.

### 3.5 hours of ride memory instead of 7.0 hours of data (original standard model)

The Powertap computer has a setting that lets you change the data collection rate. When you set up the Powertap computer (press MODE and SELECT buttons simultaneously until you see "SETUP"), you can select either '1' or '2' after you have selected the measurement system and wheel circumference.

If you select '1', the Powertap will record data every second and you'll be able to store a maximum of 3.5 hours of data at that resolution. If you select '2', you will record data approximately every other second and you'll be able to store a maximum of 7 hours of data at that resolution. You can change these settings before a ride but you'll have to remember where you left it - there's no indicator of the current setting on the main displays.

### No display on computer screen

- Computer is asleep - press one of the buttons on the computer to wake up the computer.
- Batteries need replacement - replace the computer batteries as shown on pages 33 of the User Manual.
- Computer too cold- operating temperature is 30 to 40 degrees Fahrenheit.

# TROUBLE SHOOTING



**Computer display is on, but there is no transmission icon**

- Hub is asleep - spin the wheel momentarily to wake up the hub.
- Batteries need replacement - replace the hub batteries as shown on pages 33 of the User Manual.
- Computer not seated in mount - make sure computer is firmly and correctly mounted in handlebar mount.
- Communication errors - verify that the receiver is positioned as shown in the installation section. Inspect receiver & computer mount for damaged wire or connector.
- Moisture in hub - remove cover to see if there is any condensation on the battery cover. If there is, leave cover off in a dry place for 12 hours or until moisture disappears.
- Interference with other devices - make sure you are not setting up the Powertap inside a building with a lot of electrical noise, neon signs, motors, or near power lines. Take the Powertap outside or away from the electrical disturbance to see if signal returns.
- Powertap computer's batteries are low, replace batteries as shown on pages 33 of the User Manual. We recommend using a cone wrench to remove the battery cap, not a coin.
- Check the Powertap Receiver wire and computer mount for damage.

**Displayed data blinks or does not function**

- Batteries need replacement - replace the computer batteries as shown on pages 33 of the User Manual.
- Computer not seated in mount - make sure computer is firmly and correctly mounted in handlebar mount.
- Interference with other devices - see note above about interference.
- Check for damage to receiver & computer mount.

**Power seems incorrect**

- Torque value is not zeroed - zero the torque as described on page 12 of the User Manual.

**Speed seems incorrect**

- Wheel size incorrect -refer to the chart on page 14 and enter the correct size in setup mode.

**Transmission icon flashes rapidly**

- Hub batteries need replacement - replace the hub batteries as shown on pages 33 of the User Manual.



## TROUBLE SHOOTING

### Link Software

#### General Link Trouble Shooting

The following are some problems you might have when installing and setting up your Link Software. This list will be evolving, so please visit our web site for a current troubleshooting guide.  
<http://www.cycle-ops.com>

If your problem is not addressed here you can call Customer Service at 1-800-783-7257.

#### Raw Data Files

Some of the more sneaky of you will try calculating power/heart rate for just one ride to see how cardiac fatigue might be affecting your ride. You'll do this by running the .CSV file in Excel and calculating the factor for each record. Then you'll replace the calculated column for the existing, say, Torque column. This is very naughty. You need to know that as soon as you import that data into your database, it will affect your entire database history until you delete the ride. If you want to try such experiments, it's best to import such adulterated data into a separate rider name.

#### Database Management

As long as you are keeping all the raw data (.CSV) files, you can always start over by importing the files again. Remember that you can always delete a ride and rider from the database to start over.

#### Data Differences Between Link and Powertap Computer

There are two issues here, data inconsistency and time differences.

First the display on the Powertap CPU has a 3 sample running average. This 3 sample average is used for displaying averages and maximums on the Powertap computer display. This reduces the "jumpiness" of the numbers and makes it easier to use while riding.

The data saved for download is raw, exactly as it is sent from the hub.

In the CPU set up mode (press MODE and SELECT buttons simultaneously until you see 'SETUP') you can select 1 or 2 sample recording. If you select 1 the data is sent to the CPU from the hub at 1-second intervals. The 1-second mode will save every data point sent from the hub. If you select 2 the data is sent to the CPU at 2-second intervals. The 2-second mode will in effect save only every other data point sent from the hub. Therefore in the 2-second mode Maximums can be missed.

So between the averaging and the save rate the data download will be different. In the 1-second mode the download data is always most accurate.

## TROUBLE SHOOTING



The second issue is time differences. The data points used for display on the CPU may not coincide perfectly with what is stored to memory. There can be up to a 1-sample (or 1-second) loss at the start and stop of a download file. If the CPU is in 2-second mode this max time error (2-seconds at the start and/or stop) can be as much as 4-seconds off.

The individual raw data records written to memory are extremely accurate. In fact the data has been proven in laboratory testing to be accurate to +/- 1.5%. This means the data downloaded to the Link accurately represents what was happening on your bike second by second. How we repackage the data, to make it useable does not affect or detract from its accuracy - it's just making it more user friendly.

Some of the values on the ride chart don't make any sense - I don't remember going 170 miles per hour!

The scale on both the right side and the left side of the graph consolidates several measured values and therefore must share the common vertical axis. So, to avoid 'tall' power curves and extremely 'short' speed curves, the speed is shown as a multiple of 10.

Sometimes interference can cause inflated values, you can change these values in the .CSV file by replacing the out of place number with a more realistic number such as that which precedes and follows the invalid number.

### Tips on Installation

- Do not have any other applications running while doing the installation.
- If there are lots of items in the system tray turn some off or disable for the installation process.
- If there is a long pause during the installation, do not do anything. The program may be busy and a shutdown could cause a disruption.
- There is benefit to uninstalling from the CD. If the program has been installed or partially installed and the CD is put in and allowed to autorun, it will detect the current installation and offer the choice to uninstall. This uninstall does a much better job of uninstalling than manually uninstalling or using the native windows uninstall system. The Link software will often run correctly after it has been un-installed with the CD and then re-installed.



## TROUBLE SHOOTING

### Tips on Serial Ports

The normal serial port connector is a trapezoid shape with rounded corners and has nine pins. It is about 5/8" wide and 3/8" tall. The technical name is a "DB-9 connector".

Serial ports are a very finite resource on the computer. It can have many, but only two can be used at one time. Devices that use serial ports are:

Digital camera  
PDA (Personal Digital Assistants like Palm Pilot)  
Mouse  
Modem

Check the computer BIOS that the serial ports are turned on and in a normal state. The "plug and play" mode should work for most computer setups. Sometimes this does not work and the default manual settings should be used. The typical default is COM1, 3F8, INT4 and COM2, 2F8, INT3. Note that Windows NT will not recognize the "plug and play" settings.

### Testing Original Powertap Hardware and Serial Ports with HyperTerminal

- HyperTerminal is a serial port / terminal emulation software that comes with Windows. It will allow you to test the basic communication between your computer and the Powertap link cradle and Powertap CPU. It is usually found under: start->programs->accessories->communication-> HyperTerminal
  - If you can't find it, search on your system (start->find->files or folders) for hyperterm.exe.
  - If you still can't find it - it probably was not installed on your system during setup. Go to start-> settings->control panel->add/remove programs. Select the windows setup tab. In Communications, select HyperTerminal. You will need your Windows installation media. Restart.
1. Start HyperTerminal. When the program starts you will be asked to enter a name. Type in something you will remember like "linktest". Set the "connect using" pull down menu to Direct to COM 1 (or your active COM port) and hit OK. Set the port settings to 9600 bps, 8 data bits, no parity, 1 stop bit and no flow control. Then select OK. At the bottom of the window it should say connected.
  2. With the Powertap link cable connected to the serial port (DB-9 9 pin connector) in the back of your PC and no Powertap computer attached, characters you type on the keyboard should be echoed back (appear) on the screen. If not, make sure you are using the correct serial / COM port on the PC. Note: You must see the echoed characters appear on the screen. This is a basic test that the serial connection is actually talking to the Powertap Link cradle.

## TROUBLE SHOOTING



3. Next insert the Powertap CPU into the download cradle. When you attach the Power-Tap computer to the download link cradle its display must go blank. If it does not, make sure the Powertap computer is fully seated to the cradle.

4. Type a capital "R" and you should get something like: RR 0000 3D 10 84 0F 01 5D This confirms that the download link cradle, cable, the Powertap CPU and your COM port are functioning properly. Sometimes the command you send needs to be repeated to get a response. This is normal.

5. If you only get "0000" and nothing else following it, there is a problem with the Powertap computer.

6. If you get "0000 FF FF FF FF FF FF" or "0000 00 00 00 00 00 00", again there is a problem with the Powertap computer.

7. Type a capital "D" and you should get a long string of letters, symbols and numbers. This is the downloaded data from the Powertap computer that is unreadable in HyperTerminal. If you don't get this on your screen the CPU is unable to download.

*If after reviewing this section you still have trouble, please give us a call at 800-783-7257 Ext. 159*

### Testing PRO model with HyperTerminal

The process is the same as with the original standard except the command to send is "V". The PRO will respond with XX.XX PRO XX/YY/ZZ XXXX" This is the firmware version and serial number information.

### Serial Port Trouble Shooting

- Check to make sure your COM port setting (see: Options > Application Setup) corresponds with the physical COM port on your PC.
- Check to make sure the COM port is not configured for another application. Personal Digital Assistant (PDA) software or other device applications may be occupying the port at start up. You may have to exit the occupying software to release the COM port for the Link software.
- Make sure the Link serial cable is securely connected to both the COM port on your PC and the Powertap computer. Notice that the Powertap computer should be awake (LCD segments illuminated) before you attach the Powertap computer to the Link serial cable. Notice that the screen goes blank as soon as you make a positive connection with the cable.



## TROUBLE SHOOTING

### Tips About Downloading (original standard model only)

Be sure to "CLEAR ALL" (C-ALL on the display) in the ride mode and the interval memory mode after you download your data or future rides may be lost.

To extend battery life after download:

1. Remove the CPU from the Link download cradle immediately after the download is completed. Leaving the CPU on the download cradle will contribute to excessive battery drain.

**Important:** Just removing the CPU from the download cradle and allowing it to go into the blank LCD sleep mode does not return it to its normal power-conserving mode - and you must complete the next two steps.

2. Place the CPU into the bike receiver shoe and wake it up by pressing either button.

3. Turn the rear wheel enough to allow the CPU to receive a valid signal. The rear wheel is only required to turn a few times, and it is not necessary to ride the bike.

**Important:** The CPU must receive a valid signal from the hub as indicated in the upper left-hand corner of the LCD display.

Once you have completed all three steps noted above, the CPU will be in its normal power-conserving mode and can be removed from the bike receiver shoe.

### Download Trouble Shooting

#### Download Techniques

When the Powertap CPU is placed in the download cradle, an "end of file marker" is created. This is necessary for the download process and also does not allow any further data to be recorded. To use the Powertap to record new data the "CLEAR ALL" command must be given. This is done by holding down both buttons on the Powertap CPU until the display reads "C-ALL". No new data will be recorded until this is done.

Close all other programs and applications to make sure they don't interfere with the download.

When you slide the Power-Tap computer onto the download cradle the Powertap computer display should "blank out"

# TROUBLE SHOOTING



## Unable to Download

If you have downloaded before, determine if anything has been upgraded or changed on your PC like new software, updated software, moved plugs, new hardware, updated drivers. Look for anything that may have changed the operating conditions.

Check the condition of the Link cable, pins, plug and the Link cradle contacts. Is everything fully seated?

If you have never downloaded review the information on Serial Ports and Testing Powertap Hardware with HyperTerminal in this guide.

## Does it download, but then not import?

- Does the CPU blank out when put in shoe? If it does not, take off and reseat the CPU on the shoe.
- Was there any problem with installing the Link software? If there was, do an uninstall from the CD itself and reinstall. See the installation tip list. If not, it still may be beneficial to uninstall the software with the uninstall program on the CD and then re-install.
- Is the link on the same COM port that the software is set for? (The default is COM 1) If not, set to the same COM port.
- Is there PDA hot sync software running? If there is, disable hot sync software.
- Are other programs or applications running?
- Does it work on another computer? If the Link software installs and you can successfully download data on another computer you will need to determine what is interfering by walking through all of the above items.
- Does it work with HyperTerminal? [See Tips on Testing Serial Ports and Powertap Hardware with HyperTerminal.](#)
- The Powertap computer may have fallen asleep while connected to the serial cable. Try pressing one of the Powertap buttons (either MODE or SELECT) to wake it up. Notice, however, that by pressing one of the buttons, you will not see the display illuminate while the Poweryap computer is connected to the cable - there will not be a feedback indicating that the computer woke up.



## TROUBLE SHOOTING

- Make sure you have data in the Powertap computer. Try to 'clear all' (press MODE and SELECT buttons until you see 'C-ALL' on the lower part of the display), then either go for a ride or spin the wheel long enough that you know you should have collected data (about 30 seconds should do) - you'll know this if you have the transmission icon illuminated and the Powertap display showed some accumulated time and distance.
- Make sure you have a downloadable Powertap cycle computer. If the computer reads either 'Prologue' in yellow letters on the right side of the screen or 'tune' on the left side of the screen, you do not have a downloading computer. The serial number on the Powertap computer should be 13329 or higher.
- There is a way to download the Powertap data without starting up the Link software. If you are familiar with MS-DOS commands, check under the Start menu, in Programs , click on MS-DOS Prompt. Go to the directory where you have your Link software installed. Once there, type:

```
ptapdl -samp * -com[n] -out [file_name] . csv
```

Please consult the file "ptapdl.txt"

Where [n] is the serial port to which your Powertap is connected and [file\_name] is your choice. This command will create a .CSV file and download the Powertap memory to the file.

- Check to see if the Powertap computer battery is dead or low. Downloading requires highter power and a weak battery could cause problems. Another indicator of a weak battery is inaccurate heart rate performance.

If you still have trouble after reviewing this section, please call Customer Service  
toll free 1- 800-783-7257

## WARRANTY AND TECHNICAL SUPPORT



### Warranty and Technical Support

If you find a problem you cannot solve yourself or with the help of your dealer, try one of the support options listed below. In most cases problems can be resolved via one of these channels with a minimum of downtime.

Web site: <http://www.power-tap.com>

E-Mail: [custsrv@graberproducts.com](mailto:custsrv@graberproducts.com)

Phone: 1-800-783-7257

Fax:(608)274-1702

### Warranty

Graber Products warrants its Powertap products against defects in manufacturing and workmanship for a period of one year, beginning at the date of purchase, or from the date of manufacture in the absence of a proof of purchase. In the event of a warranty issue, Gruber will repair or replace the item

at its discretion. Gruber Products is not responsible for any indirect or consequential costs or damages associated with the warranty of the product. Our products are not covered under warranty in cases exhibiting signs of abuse, improper maintenance or installation, crash, using the product with non-compatible components, or using the product for purposes for which it was not designed. This warranty is also void if the product has been modified from its original form, including changes in aesthetics, serial numbers or logos. Gruber is not responsible for basic hub maintenance, such as re-packing bearings and bearing adjustments.

### Warranty Procedures

If it appears that a Powertap component is not working properly, please take the time to inspect and troubleshoot the system as best as possible. In many instances, solutions may be as simple as replacing a bearing or adjusting a sensor. Often small parts can repaired at the shop, instead of the

longer and more expensive option of sending the unit back for repair. If you feel the need to warranty your Powertap, please return your product through the channel that you purchased it from or contact Gruber Products, Inc. at 1-800-783-7257.

**FCC Statement of Compliance**

This device complies with part 15 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

*Note:* This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a normal installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

